

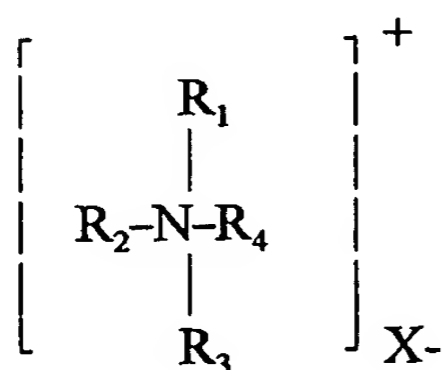
What is claimed is:

1. A clay/organic chemical composition useful as an additive to polymer, plastic and resin matrices to produce nanocomposites, comprising an ion-exchanged reaction product produced by the intercalation and reaction of:

- (a) one or more smectite clays;  
(b) one or more quaternary ammonium compounds; and  
(c) one or more non-anionic organic materials.

2. The composition of Claim 1 wherein one or more of the smectite clays are selected from the group consisting of bentonite and hectorite.

3. The composition of Claim 1 wherein one or more of the quaternary ammonium compounds has the formula:



wherein  $R_1$  comprises a group selected from (i) linear or branched aliphatic, aralkyl, or aromatic hydrocarbon groups having from 8 to 30 carbon atoms or (ii) alkyl or alkyl-ester groups having 8 to 30 carbon atoms;  $R_2$ ,  $R_3$  and  $R_4$  are independently selected from the group consisting of (a) linear or branched aliphatic, aralkyl and aromatic hydrocarbon, fluorocarbon or other halocarbon groups having from 1 to about 30 carbon atoms; (b) alkoxyated groups containing from 1 to about 80 moles of alkylene oxide; (c) amide groups, (d) oxazolidine groups, (e) allyl, vinyl, or other alkenyl or alkynyl groups possessing reactive unsaturation and (f) hydrogen; and  $X^-$  comprises an anion selected from the group consisting of chloride, methyl sulfate, acetate, iodide and bromide.

4. The composition of Claim 1 wherein one or more of the quaternary ammonium compounds comprises a quaternary ammonium compound that contains at least one, preferably two or three, hydrocarbon chains having from about 8 to about 30 carbon atoms and has either no hydrophilic carbon chains or has hydrophilic radicals having a total of about 9 moles of ethylene oxide or less.

5. The composition of Claim 1 wherein one or more of the quaternary ammonium compounds are selected from the group consisting of 2M2HT and M2HES.

6. The composition of Claim 1 wherein one or more of the non-anionic organic materials are selected from the group consisting of polyurethanes, polyamides, polyesters, polycarbonates, polyepoxides and polyolefins.

7. The composition of Claim 1 wherein one or more of the non-anionic organic materials are water soluble and selected from the group consisting of polyvinylpyrrolidones and their hydrolysis products, polyvinyl alcohols, polymethacrylamides, poly(N,N-dimethylacrylamides), poly(N-isopropylacrylamides), poly(N-acetamidacryl amides), poly(N-acetimidomethacrylamides), polyvinylloxazolidones, polyvinylmethyl oxazolidones, polyoxypropylenes, polyoxyethylenes and copolymers thereof.

8. A nanocomposite comprising:

a) a matrix selected from the group consisting of polymer, plastic and resin compositions and,

b) a clay/organic chemical composition comprising an ion-exchanged reaction product produced by the intercalation and reaction of:

- i) one or more smectite clays;
- ii) one or more quaternary ammonium compounds; and
- iii) one or more non-anionic organic materials.

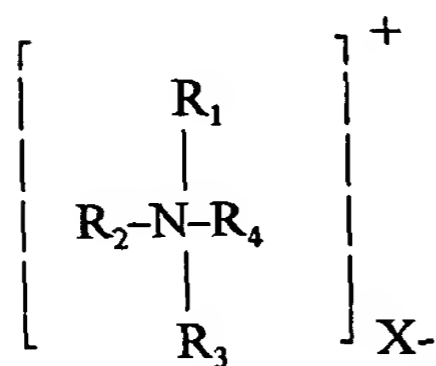
9. The nanocomposite of Claim 8 wherein the matrix of paragraph a) is selected from the group consisting of resins based on formaldehyde, alkyd resins, ureas, phenols, melamines, polyurethanes, polyesters and plastics based on styrene, vinyl, allyl and acrylic monomers, polyamides, polyolefins, polyimides, and rubbers.

10. The nanocomposite of Claim 8, wherein the matrix of paragraph a) is a plastic selected from the group consisting of homopolymer and copolymers of polyesters including linear polyesters, polyamides including nylon particularly nylon 6, polyethers, polycarbonates, polyacetal resins and mixtures and blends thereof.

11. The nanocomposite of Claim 8 wherein the matrix of paragraph a) is a glycol modified polyester.

12. The nanocomposite of Claim 8 wherein the smectite clay of paragraph b)(i) is selected from the group consisting of bentonite and hectorite.

13. The composition of Claim 8 wherein one or more of the quaternary ammonium compounds has the formula:



wherein  $R_1$  comprises a group selected from (i) linear or branched aliphatic aralkyl, or aromatic hydrocarbon groups having from 8 to 30 carbon atoms or (ii) alkyl or aralkyl-ester groups having 8 to 30 carbon atoms;  $R_2$ ,  $R_3$  and  $R_4$  are independently selected from the group consisting of (a) linear or branched aliphatic, aralkyl and aromatic hydrocarbon, fluorocarbon or other halocarbon groups having from 1 to about 30 carbon atoms; (b) alkoxyated groups containing from 1 to about 80 moles of alkylene oxide; (c) amide groups, (d) oxazolidine groups, (e) allyl, vinyl, or other alkenyl or alkynyl groups possessing reactive unsaturation and (f) hydrogen; and  $X^-$  comprises an anion selected from the group consisting of chloride, methyl sulfate, acetate, iodide and bromide.

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14. The nanocomposite of Claim 8 wherein one or more of the organic materials of paragraph b)(iii) are selected from the group consisting of polyurethanes, polyamides, polyesters, polycarbonates, polyepoxides and polyolefins.

5 15. The nanocomposite of Claim 8 wherein the clay/chemical composition comprises between 1% and 30% by weight of the nanocomposite.

16. The nanocomposite of Claim 15 wherein the clay/chemical composition comprises between 3.5% and 12.0% of the nanocomposite.

17. A rheological additive for liquid organic systems comprising an ion-exchanged reaction product produced by the intercalation and reaction of:

- 10 Sub A
- (a) one or more smectite clays;
  - (b) one or more quaternary ammonium compounds; and
  - (c) one or more non-anionic organic materials.

18. The rheological additive of Claim 17 wherein the smectite clay of paragraph a) is bentonite.

15 19. The rheological additive of Claim 17 wherein one or more of the quaternary ammonium compounds of paragraph b) is selected from the group consisting of 2M2HT and M2HES.

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